from the disease when they were half grown; the rest were quite well developed but at the last part of the experiment began to be affected. Several heads were large, the largest being over the greatest number of wires and nearest the electrodes. Examination of the roots disclosed the same phenomena as in A.

Near plot B were also set twenty other plants, subjected to like conditions as the first, but without electricity; all but one died from mildew before they were half grown, the solitary plant that survived being only partly developed at the close of the experiment, and even this was badly affected with the desease.

Everything considered, the results were in favor of electricity. Those plants subjected to the greatest electrical influence were hardier, healthier, larger, had a better color and were much less affected by mildew than the others. Experiments were made with various grasses, but no marked results were obtained.

The question would naturally arise whether there may not be a limit reached where electricity would completely overcome the attack of mildew and stimulate the plant to a healthy and vigorous condition throughout its entire growth. From the fact that the hardiest, healthiest, and largest heads of lettuce grew over the greatest number of currents and nearest the electrodes, it would seem that electricity is one of the agents employed by nature to aid in supplying the plant with nourishment and to stimulate its growth. To what extent plants may be submitted to electrical influence, or what strength of current is best suited to them and what currents prove detrimental to their development, have not been determined as yet, but it is desirable to continue this research until some definite information shall be gained on these points. Probably different varieties of plants differ greatly in their capacity for enduring the action of electric currents without injury — experiment alone must determine this.

It has been proved that the slow discharge of static electricity facilitates the assimilation of nitrogen by plants. Faraday showed that plants grown in metallic cages, around which circulated electric currents, contained fifty per cent less organic matter than plants grown in the open air. It would seem from the researches of the latter physicist, that those plants requiring a large percentage of nitrogen for their development would be remarkably benefited if grown under electric influence.

LETTERS TO THE EDITOR.

*** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

On request in advance, one hundred copies of the number containing his communication will be furnished free to any correspondent.

The editor will be glad to publish any queries consonant with the character of the journal.

The First Locomotive Run in America.

IT was in 1829, the same year in which Stephenson, with his "Rocket," demonstrated the practicability of rapid steam traction on railways. The engine was named the Stonebridge Lion. It was made in England and imported by the Delaware and Hudson Canal Company, and designed to draw coal from their mines in Carbondale to the head of their canal in Honesdale, Penn. On its arrival, it was placed on the railway and run from Honesdale to Seeleyville, a little over a mile. It was found to be too tall to go under a highway bridge over the track at that place, and was reversed and run back to Honesdale. All parts of the railway above the surface of the ground were built on trestles, and the heavy engine racked them so much as to endanger safety. For these reasons the locomotive was set off by the side of the track, and a board shed built over it. The railway was planked, and horses employed to draw the cars. The engine stood there safe for several years.

The writer was personally acquainted with these facts. Two men who rode on that trip are living at this time.

In 1840 and 1841, while I was a student in the Honesdale Academy, I found the boards on one side of the shed torn off and the engine exposed to view. I spent many hours in trying to study out its mechanism and movement. No published description of a steam engine was then within my reach. The Stonebridge Lion had four wheels, three or three and a half feet in diameter, and the boiler rested directly on the axles. The cylinders were vertical, one on each side of the boiler near the hind wheels. There were two heavy iron walking-beams a few feet above the boiler, and to one end of each a piston-rod was attached by Watt's parallelogram. The other ends of the beams were joined by swinging-rods to cranks at right angles to each other on the forward wheels. There was no whistle or bell, I think. The engineer stood on a small open platform behind the boiler.

Soon after 1841 the engine began to be carried off piece by piece, mostly by blacksmiths and machinists; and I am told that only one small piece of the iron is now in existence in its primitive form. If the engine had been kept intact, it would be worth almost its weight in silver for exhibition in Chicago in 1893.

M. H.

The Historical American Exhibition at Madrid.[1]

ONE of the most interesting and instructive celebrations proposed for the year 1892 is the Spanish celebration, the chief feature of which will be an exhibition at Madrid, termed the Historical American Exhibition, the special object of which is to illustrate primitive American life and the history of the period of discovery and conquest. In selecting the prehistoric and early historic eras for illustration, the Spaniards will make their own exhibition complete in itself, without in the least competing with the Chicago exhibition.

The plan of the exhibition is, within its limits, a very broad one, comprising five general divisions, viz., prehistoric America, the historic period, Indian industrial arts, cartography, nautical instruments, etc., and the fine arts and kindred subjects. Under the head of prehistoric America, plans, models, reproductions, drawings, etc., are solicited of ancient caves and caverns, and anything that may help to show the use of these primitive places as human dwellings. Similar models, drawings, or photographs are desired of American menhirs, dolmens, and mounds, as well as lacustrine dwellings. All sorts of implements and objects relating to this period are desired, such as stone weapons, articles of bone and horn, pottery, ornaments, utensils of bone, wood, stone, and other materials, with fossil or animal bones throwing light on the archæology of this time. Examples of all the ages and periods of primitive life as they can be traced on the American continent are wanted.

In the historic period the objects desired include models of ancient American buildings, architectural remains, plans, models, and drawings of restored monuments. Examples of sculpture, bas-reliefs, architectural paintings, and other forms of painted decoration form another class. Under industrial art is included clothing and adornment of the aborigines and uncivilized Indians, with implements of war, offensive and defensive. Jewels of gold, silver, bone and ivory, pottery, household utensils, and articles used in transportation by water and land, constitute another division of this branch, while written documents in native tongues, pictures, and photographs of Indians and effigies showing native costumes, models of Indian dwellings, and Indian crania, form a third division.

The department of cartography includes maps, plans, charts, and drawings, and all that concerns ancient cartography, with models of vessels anterior to the voyage of Columbus, as well as those he himself used. A section is devoted to nautical instruments, with the idea of illustrating the instruments, charts, and maps in use at the period of discovery, while objects in personal use by Columbus and pictures of the same are also desired. The fine arts department includes ancient architectural monuments, sculpture, paintings, industrial and artistic work following the discovery, American coins, literary and scientific publications, manuscripts, charts, and plans of all kinds, from the discovery to the middle of the eighteenth century.

Most liberal inducements are offered to intending exhibitors from America. The exhibition will be held in the new library and national museum building in the park at Madrid, which will be used for the first time for this purpose, the exhibition serving as a sort of inauguration of the structure, which has been a num-

[1] This letter appeared also in The Nation.

ber of years in building. It will be opened on Sept. 12, 1892, and will close on Dec. 31 of the same year, thus preceding the Chicago exhibition, which it is designed, in a measure, to supplement. All objects, if securely and properly packed, will be forwarded gratis to Madrid, and returned to the exhibitor free of expense, the exhibition not only bearing the cost of transportion, but also, when desired, attending to the arrangement and display of the objects without any charge. Those who desire special cases of their own may provide them, and special buildings may also be erected in the park if the design is approved by the general committee. All objects for the exhibition will be admitted duty free into Spain if they are withdrawn at the close of the exhibition, but two months will be allowed after the end of the exhibition before articles need be returned.

An international jury, proportionate to the number of the exhibitors from different countries and the importance of their exhibits, will examine the articles displayed and award the prizes. These will consist of a first prize of honor, a gold medal, a silver medal, a bronze medal, and honorable mention, each medal being accompanied with a diploma.

The exhibition covers, of course, the entire American continent, but to insure its complete success the active co-operation and assistance of citizens of the United States is especially desired. There is every reason why Americans should both be interested in this exhibition and take part in it. The conditions are liberal, the prizes ample, and the time is especially convenient to intending exhibitors at the Chicago exhibition, as objects may be exhibited both at Madrid and at Chicago. Nor is the novelty of the exhibition its least merit. Early American history has always been a favorite topic of study among European scholars, but it is safe to say that if this exhibition is carried out as it is planned, it will offer Europeans the first opportunity they have had to study primitive American life in its completeness. American collections are very rich in the materials most desired at Madrid, and it is most sincerely to be hoped that the gracious invitation of the Spanish people to participate in their Columbian celebration will meet with a generous and hearty support from American scholars and collectors.

BARR FERREE.

New York.

At What Time were the Galapagos Islands Discovered?

I SHOULD be greatly obliged to anyone who could give me some information in regard to the discovery of the Galapagos Islands. The first notice I have been able to find is in the Atlas of Abraham Ortelius, published in 1570, where the Islands are spelled "Galopegos" and "Galepegos" (Ortelius, Abraham, "Typus Orbis Terrarum," 1570; second edition, 1580; "Theatrum oder Schaubuch des Erdkreys, Autdorff, Americae sive novi orbis novae descriptio," 1570). On the splendid map of Diego Ribero, prepared between 1527 and 1529, the Galapagos Islands are not represented (Ribero, Diego, J. G. Kohl, "Die beiden aeltesten General Karten von America ausgeführt in den Jahren, 1527 and 1529, auf Befehl Kaiser Carl's, v.," Weimar, 1860). It seems therefore probable that these islands were discovered in the beginning of the sixteenth century, before 1570. The word *galapago* itself seems to be of South American origin; it means land-tortoise

G. BAUR.

Clark University, Worcester, Mass., Jan. 10.

BOOK-REVIEWS.

School and College; devoted to secondary and higher education. Edited by Ray Greene Huling. Vol. I., No. 1, January, 1892. Boston, Ginn & Co.

MAGAZINES and newspapers devoted to educational subjects multiply apace, so that if our teachers are not properly informed on matters relating to their work, it will not be for want of the means of intercommunication. This latest comer in the field is a magazine of sixty-four pages, to be issued every month except July and August, at twenty cents a number, or $1.50 a year. The articles in this opening number show very plainly the influence of the educational ideas just now prevalent; indeed, they may be said to show little else. The writers appear to agree that the study of Greek is destined to be abandoned; though the editor speaks of this as an event that is inevitable rather than as one to be desired. The most interesting paper in the magazine is that by President Andrews of Brown University on "Some of the Next Steps Forward in Education," its most important point being the suggestion that teachers ought to enter into closer moral and social relations with their pupils. Mr. B. C. Burt has an article advocating the beginning of philosophical study at an earlier age than is now customary; but unless the subject can be made more easily intelligible than it is in his article, we fear that his wishes will not be realized. Mr. John Tetlow gives an account of "The Greek Method of Performing Arithmetical Operations," which will be of interest to mathematical students; and Mr. James H. Blodgett has a brief paper on "Secondary Education in Census Years." The rest of the magazine is occupied with educational news, both domestic and foreign, a few book reviews of no great value, and several brief "Letters to the Editor." The new magazine has some good points, and its field, though narrow, may be made interesting by proper cultivation; but it seems to us that an improvement in the quality of our educational literature is more important than an increase in its quantity.

Geological Survey of Alabama. EUGENE ALLEN SMITH, Ph.D., State Geologist. Report on the Coal Measures of the Plateau Region of Alabama, by Henry McCalley, Assistant State Geologist, including a report on the Coal Measures of Blount County, by A. M. Gibson, with a Map of the Coal-Fields and two Colored Geological Sections across the Plateau Region and Intermediate Valleys. Montgomery, Ala., 1891.

IN the Report of Progress of the Alabama Geological Survey, for the years 1877–8, the division of the Warrior Coal-Field into "Plateau Region" and "Warrior Basin" was first made by Dr. Smith, the State geologist. Characteristic of the Plateau Region is the circumstance that the limestone beds which underlie the capping of Coal Measures are above the general drainage level of the country. This arrangement of the two classes of strata determines in great measure the character of the scenery, for the removal by erosion of the more perishable limestone causes the undermining of the harder strata above, which from time to time break off with nearly vertical faces, forming cliffs which overlook all the valleys. The three principal valleys that traverse this region, in a north-east and south-west direction, are anticlinal valleys, more or less complicated by faulting and overlapping; they are Wills's, Murphree's, and Brown's Valleys, the latter being an extension into this State of the great Sequatchee Valley of Tennessee. Between these anticlinals the Coal Measures occupy shallow synclinal troughs, which also show secondary undulations, with axes nearly at a right angle to the axes of the synclinals and anticlinals, i.e., approximately north-west and south-east. In the anticlinal valleys strata down to the Cambrian are exposed, but in the smaller valleys, cut by streams in the synclinal troughs, only the subcarboniferous measures are reached by the erosion.

Towards the south-west the Coal Measures and their underlying strata slope gradually and more rapidly than the topography, and the Plateau Region thus grades insensibly into the Basin, where none of the beds underlying the coal are above drainage. In the Plateau Region, and particularly in its north-eastern portion, only the lowest of the rocks of the Coal Measures are left capping the mountains, viz., the two conglomerates with their intervening and underlying beds; but further towards the south-west, other higher members of the Coal Measures come in and the plateau like character is in equal measure lost.

The Report for 1877–8, above referred to, and a subsequent Report for 1879–80, contained notes chiefly on the Coal Measures of the Warrior Basin. In 1886 a large volume from the pen of Mr. McCalley, "On the Warrior Field," was published by the survey. This report also was concerned chiefly with the Measures of the Warrior Basin, though containing some notes on part of the Plateau Region. The present volume deals with the Measures of the Plateau Region alone, and presents about all the information at this time available. The two colored sections exhibit well the geological and topograhic features of this region, and show the gradual sinking of the strata towards the south-west and the passage into the Basin proper.